

From: Jolleen Werst, Superfund Records Manager

To: R.V. Hopkins, Site File

Subj: Documents located during the Move from the Regional Office, in Kansas City Kansas to the Regional Office in Lenexa in October, 2012

The attached documents pertain to HRS Scoring packages. The documents attached include but are not limited to the following:

- Pre HRS Scoring Package
- Correspondence regarding the Scoring Package
- HRS Scoring Package
- Attachments to the Scoring Package

The pink separator sheets will be retained in the original package for scanning and filing purposes.

The separator sheet will provide the end user the ability to determine where each original document starts.

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Superfund

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 7
25 FUNSTON ROAD
KANSAS CITY, KANSAS 66115

February 25, 1985

MEMORANDUM

SUBJECT: R.V. Hopkins Site - Davenport, Iowa

FROM: Paul E. Doherty *PD*
Chief, SINV/EP&R/ENSV

TO: Robert L. Morby
Chief, WMBR/ARWM

THRU: William J. Keffer *WJ*
Chief, EP&R/ENSV

John C. Wicklund
Director, ENSV

David A. Wagoner
Director, WSTM

Attached for your review is an HRS (25.94) scoring package, including documentation, for the above referenced facility.

The package will be reviewed and revised as necessary, in accordance with recent guidance on HRS scoring procedures.

If you have any questions or comments, please call me at 236-3888.

Attachment

cc: Debbie Kopsick, E&E

PA-ARWM/W
FEB 27 1985
Region VII K.C., MO

Facility name:	R.V. Hopkins, Inc.	
Location:	Davenport, Iowa	
EPA Region:	VII	
Person(s) in charge of the facility:	R.V. Hopkins, - President	
Name of Reviewer:	William Oberle	Date: 2/12/85
General description of the facility:		
(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)		
<p>The company is a drum reconditioning facility. It has stored drummed caustic and paint wastes as well as drums for recycling onsite since 1964. Use of the property began in 1892 as a limestone quarry and in 1940, it was used as an open dump for demolition debris and industrial salvage. Contaminants detected onsite include metals, solvents and pesticides. Soils, sediments and groundwater were contaminated.</p>		
<p>Scores: $S_M = 25.94$ $S_{gw} = 42.85$ $S_{sw} = 13.33$ $S_a = 0.0$ $S_{FE} = 0.0$ $S_{DC} = 50.0$</p>		

FIGURE 1
HRS COVER SHEET

Ground Water Route Work Sheet						
Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)	
[1] Observed Release	0 <u>45</u>	1	45	45	3.1	
If observed release is given a score of 45, proceed to line [4] . If observed release is given a score of 0, proceed to line [2] .						
[2] Route Characteristics					3.2	
Depth to Aquifer of Concern	0 1 2 3	2		6		
Net Precipitation	0 1 2 3	1		3		
Permeability of the Unsaturated Zone	0 1 2 3	1		3		
Physical State	0 1 2 3	1		3		
Total Route Characteristics Score				15		
[3] Containment	0 1 2 3	1		3	3.3	
[4] Waste Characteristics					3.4	
Toxicity/Persistence	0 3 6 9 12 15 <u>18</u>	1	18	18		
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1	8	8		
Total Waste Characteristics Score			26	26		
[5] Targets					3.5	
Ground Water Use	0 1 2 <u>3</u>	3	9	9		
Distance to Nearest Well/Population Served	0 4 6 8 10 <u>12</u> 16 18 20 24 30 32 35 40	1	12	40		
Total Targets Score			21	49		
[6] If line [1] is 45, multiply [1] x [4] x [5] If line [1] is 0, multiply [2] x [3] x [4] x [5]			24,570	57,330		
[7] Divide line [6] by 57,330 and multiply by 100			$S_{gw} = 42.85$			

FIGURE 2
GROUND WATER ROUTE WORK SHEET

Surface Water Route Work Sheet						
Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)	
1 Observed Release	(0) 45	1	0	45	4.1	
If observed release is given a value of 45, proceed to line 4 . If observed release is given a value of 0, proceed to line 2 .						
2 Route Characteristics					4.2	
Facility Slope and Intervening Terrain	(0) 1 2 3	1	0	3		
1-yr. 24-hr. Rainfall	0 1 (2) 3	1	2	3		
Distance to Nearest Surface Water	0 1 2 (3)	2	6	6		
Physical State	0 1 2 (3)	1	3	3		
Total Route Characteristics Score			11	15		
3 Containment	0 1 2 (3)	1	3	3	4.3	
4 Waste Characteristics					4.4	
Toxicity/Persistence	0 3 6 9 12 15 (18)	1	18	18		
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 (8)	1	8	8		
Total Waste Characteristics Score			26	26		
5 Targets					4.5	
Surface Water Use	0 1 (2) 3	3	6	9		
Distance to a Sensitive Environment	0 1 (2) 3	2	4	6		
Population Served/Distance to Water Intake Downstream	(0) 4 6 8 10 12 16 18 20 24 30 32 35 40	1	0	40		
Total Targets Score			10	55		
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			8,580	64,350		
7 Divide line 6 by 64,350 and multiply by 100			$S_{sw} = 13.33$			

FIGURE 7
SURFACE WATER ROUTE WORK SHEET

Air Route Work Sheet Not Scored						
Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)	
[1] Observed Release	0 45	1		45	5.1	
Date and Location:						
Sampling Protocol:						
If line [1] is 0, the $S_a = 0$. Enter on line [5] . If line [1] is 45, then proceed to line [2] .						
[2] Waste Characteristics					5.2	
Reactivity and Incompatibility	0 1 2 3	1		3		
Toxicity	0 1 2 3	3		9		
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8		
Total Waste Characteristics Score				20		
[3] Targets					5.3	
Population Within 4-Mile Radius	0 9 12 15 18 21 24 27 30	1		30		
Distance to Sensitive Environment	0 1 2 3	2		6		
Land Use	0 1 2 3	1		3		
Total Targets Score				39		
[4] Multiply [1] x [2] x [3]				35,100		
[5] Divide line [4] by 35,100 and multiply by 100			$S_a = 0.0$			

FIGURE 9
AIR ROUTE WORK SHEET

	s	s ²
Groundwater Route Score (S _{gw})	42.85	1836.12
Surface Water Route Score (S _{sw})	13.33	177.69
Air Route Score (S _a)	0.0	0.0
$S_{gw}^2 + S_{sw}^2 + S_a^2$		2013.81
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2}$		44.88
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2} / 1.73 = S_M =$		25.94

FIGURE 10
WORKSHEET FOR COMPUTING S_M

Fire and Explosion Work Sheet						
Rating Factor	Assigned Value (Circle One)		Multi- plier	Score	Max. Score	Ref. (Section)
1 Containment	1	3	1		3	7.1
2 Waste Characteristics						7.2
Direct Evidence	0	3	1		3	
Ignitability	0	1 2 3	1		3	
Reactivity	0	1 2 3	1		3	
Incompatibility	0	1 2 3	1		3	
Hazardous Waste Quantity	0	1 2 3 4 5 6 7 8	1		8	
Total Waste Characteristics Score					20	
3 Targets						7.3
Distance to Nearest Population	0	1 2 3 4 5	1		5	
Distance to Nearest Building	0	1 2 3	1		3	
Distance to Sensitive Environment	0	1 2 3	1		3	
Land Use	0	1 2 3	1		3	
Population Within 2-Mile Radius	0	1 2 3 4 5	1		5	
Buildings Within 2-Mile Radius	0	1 2 3 4 5	1		5	
Total Targets Score					24	
4 Multiply 1 x 2 x 3					1,440	
5 Divide line 4 by 1,440 and multiply by 100				SFE =		

FIGURE 11
FIRE AND EXPLOSION WORK SHEET

Direct Contact Work Sheet						
Rating Factor	Assigned Value (Circle One)	Multi- plier	Score	Max. Score	Ref. (Section)	
1 Observed Incident	<u>0</u> 45	1	<u>0</u>	45	8.1	
If line 1 is 45, proceed to line 4 If line 1 is 0, proceed to line 2						
2 Accessibility	0 1 <u>2</u> 3	1	<u>2</u>	3	8.2	
3 Containment	0 <u>15</u>	1	<u>15</u>	15	8.3	
4 Waste Characteristics Toxicity	0 1 2 <u>3</u>	5	<u>15</u>	15	8.4	
5 Targets					8.5	
Population Within a 1-Mile Radius	0 1 2 3 <u>4</u> 5	4	<u>16</u>	20		
Distance to a Critical Habitat	0 1 <u>2</u> 3	4	<u>8</u>	12		
Total Targets Score			<u>24</u>	32		
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			<u>10,800</u>	21,600		
7 Divide line 6 by 21,600 and multiply by 100			SDC = <u>50.0</u>			

FIGURE 12
DIRECT CONTACT WORK SHEET

August 16, 1982

FIT QUALITY ASSURANCE TEAM

DOCUMENTATION RECORDS
FOR
HAZARD RANKING SYSTEM

INSTRUCTIONS: As briefly as possible summarize the information you used to assign the score for each factor (e.g., "Waste quantity = 4,230 drums plus 800 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference. Include the location of the document.

FACILITY NAME: R.V. Hopkins, Inc.

LOCATION: Davenport, Iowa.

DATE SCORED: February 12, 1985

PERSON SCORING: William Oberle, E&E/FIT

PRIMARY SOURCE(S) OF INFORMATION (e.g., EPA region, state, FIT, etc.):
EPA Regional files, Iowa Geological Survey reports, U.S. Army Corps. of Engineers Aerial Photographs, personal and telephone interviews, City of Davenport Iowa records.

FACTORS NOT SCORED DUE TO INSUFFICIENT INFORMATION:
The air route was not scored due to insufficient data.

COMMENTS OR QUALIFICATIONS:

The site is not noted as a fire hazard by the local fire marshal and therefore this section was not scored. The observed released detected contaminants at low levels which may not be completely representative of their concentrations in situ.

GROUND WATER ROUTE

1. OBSERVED RELEASE

Contaminants detected (5 maximum):

Contaminants detected in the alluvial groundwater onsite included:
lead, barium, arsenic, O-xylene, chloroethane. (1)

Score = 45

Rationale for attributing the contaminants to the facility:

These contaminants were detected at low levels in onsite monitoring wells but not in the upgradient monitoring well offsite. These contaminants were also detected in their highest sediment concentrations onsite (except chloroethane). Site is the only known source of the organic***contaminants in the area surrounding the wells.(1,2).

2. ROUTE CHARACTERISTICS Not scored because of observed release.

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

Depth(s) from the ground surface to the highest seasonal level of the saturated zone [water table(s)] of the aquifer of concern:

Depth from the ground surface to the lowest point of waste disposal/storage:

Net Precipitation

Mean annual or seasonal precipitation (list months for seasonal):

Mean annual lake or seasonal evaporation (list months for seasonal):

Net precipitation (subtract the above figures):

Permeability of Unsaturated Zone

Soil type in unsaturated zone:

Permeability associated with soil type:

Physical State

Physical state of substances at time of disposal (or at present time for generated gases):

* * *

3. CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Method with highest score:

4. WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated: (1,7)	<u>Toxicity</u>	<u>Persistence</u>
Lead	3	3
Chloroform	3	3
O-Xylene	2	1
Arsenic	3	3

Compound with highest score:

Chloroform, arsenic and lead had the highest scores.

Score = 18

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (Give a reasonable estimate even if quantity is above maximum):

Total waste quantity is 12,762 cubic yards. (2)

Score = 8

Basis of estimating and/or computing waste quantity: 391,500 lbs. of caustic sludge and incinerator ash produced and stored onsite in 1981(2). If 50% is caustic sludge then $195,750 \text{ lbs/year} \times 3 \text{ years (1981-84)} = 587,250 \text{ lbs.}$ $587,250 \div 2,200 \text{ lbs/ton} = 266.94 \text{ tons}$ stored onsite. In addition, lead contaminated foundry sands were used as fill materials (1). The area covered was approximately $150 \text{ yds} \times 166.6 \text{ yds} \times 0.5 \text{ yd} = 12,495 \text{ cubic yards. (2)}$

Total waste quantity = 12,495 cubic yards. (2)
= 12,761.0 or 12,762 cubic yards of wastes.

* 1 ton = 1 cubic yard. (7)

5. TARGETS

Ground Water Use

Use(s) of aquifer(s) of concern within a 3-mile radius of the facility:

The Silurian - Devonian aquifer is used commercially in food processing and soft drink production (1,4). Rural drinking water wells are located in the Silurian-Devonian aquifer which has been determined to be in connection with the alluvial aquifer (3,14).

Score = 3

Distance to Nearest Well

Location of nearest well drawing from aquifer of concern or occupied building not served by a public water supply:

The nearest commercial well being used is 1500 ft. north of the site (1,4). There are four known drinking water wells located in rural areas within 3 miles west of the site (13).

Distance to above well or building:

The distances to the nearest known drinking water wells between 1.5-2.2 miles (12).

Score = 2

Population Served by Ground Water Wells Within a 3-Mile Radius

Identified water-supply well(s) drawing from aquifer(s) of concern within a 3-mile radius and populations served by each:

There are four drinking water wells located 1.5-2.2 miles west of the site which indicates that the residences in this area use wells as a drinking water source. (12, 13, 16)

Population served is $3.8 \text{ persons/residences/well} \times 145 \text{ residences} = 551$

Computation of land area irrigated by supply well(s) drawing from aquifer(s) of concern within a 3-mile radius, and conversion to population (1.5 people per acre):

None known to date.

Total population served by ground water within a 3-mile radius:

At $3.8 \text{ persons/house/well} = 551 \text{ persons served by groundwater within 3 miles of site. (7).}$

Matrix score = 12

SURFACE WATER ROUTE

1. OBSERVED RELEASE

Contaminants detected in surface water at the facility or downhill from it (5 maximum):

None known to date.

Rationale for attributing the contaminants to the facility:

* * *

2. ROUTE CHARACTERISTICS

Facility Slope and Intervening Terrain

Average slope of facility in percent:

Facility slope is approximately 2-3% (8).

Name/description of nearest downslope surface water:

Mississippi River is the nearest downslope body of water. (8).

Average slope of terrain between facility and above-cited surface water body in percent:

Slope of the intervening terrain is < 3% (8).

Is the facility located either totally or partially in surface water? .

Is the facility completely surrounded by areas of higher elevation?

No, the terrain is higher only to the north (8).

1-Year 24-Hour Rainfall in Inches

The 1 year 24 hr rainfall is 2.75 inches (7).

Score = 2

Distance to Nearest Downslope Surface Water

The distance to the nearest surface is approximately 800-900 feet (7).

Score = 3

Physical State of Waste

Wastes were sludges and spilled liquids and fines from foundry sands and incinerator ash. Sludges give the highest score at 3. (1,2,)

3. CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Leaking drums contained caustic sludges and paint sludges (1,2). Former quarry area used foundry sands, industrial scrap metal, batteries and fly ash as fill. It was unlined and exhibited ponding (1,2,6).

Method with highest score:

Both methods scored the same.

Score = 3

4. WASTE CHARACTERISTICS

Toxicity and Persistence

Compounds(s) evaluated

	<u>Toxicity</u>	<u>Persistence</u>
Lead	3	3
O-xylene	2	1
Arsenic	3	3
PCB's	3	3
Endrin	3	3

Compound with highest score:

Endrin, PCB's, lead, and arsenic had the highest scores.

Score = 18.

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (Give a reasonable estimate even if quantity is above maximum):

Same as Section 4 - Groundwater route (12,762 cu. yds).

Score = 8

Basis of estimating and/or computing waste quantity:

Same as Section 4 - Groundwater route (1).

* * *

5. TARGETS

Surface Water Use

Use(s) of surface water within 3 miles downstream of the hazardous substance:

Surface waters downstream are used for commercial shellfishing, fishing and recreation (2,9).

Is there tidal influence?

There is no tidal influences.

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

Not applicable to this site.

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

The nearest wetlands are 2.5 miles downstream (8,9).

Distance to critical habitat of an endangered species or national wildlife refuge, if 1 mile or less:

The entire river area of Davenport, Ia, is used by Bald Eagles for a winter feeding and nesting area. A food source is fish from the Mississippi River (9). Score of 2 is assigned.

Population Served by Surface Water

Location(s) of water-supply intake(s) within 3 miles (free-flowing bodies) or 1 mile (static water bodies) downstream of the hazardous substance and population served by each intake:

There are none known to date (8, 10).

Computation of land area irrigated by above-cited intake(s) and conversion to population (1.5 people per acre):

None known at this time.

Total population served:

None known at this time.

Name/description of nearest of above water bodies:

Not applicable at this time.

Distance to above-cited intakes, measured in stream miles.

Not applicable at this time.

AIR ROUTE

1. OBSERVED RELEASE None observed at this time.

Contaminants detected:

Date and location of detection of contaminants:

Methods used to detect the contaminants:

Rationale for attributing the contaminants to the site:

* * *

2. WASTE CHARACTERISTICS Not able to be scored at this time.

Reactivity and Incompatibility

Most reactive compound:

Most incompatible pair of compounds:

Toxicity

Most toxic compound:

Hazardous Waste Quantity

Total quantity of hazardous waste:

Basis of estimating and/or computing waste quantity:

* * *

3. TARGETS Not able to be scored at this time.

Population Within 4-Mile Radius

Circle radius used, give population, and indicate how determined:

0 to 4 mi	0 to 1 mi	0 to 1/2 mi	0 to 1/4 mi
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Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

Distance to critical habitat of an endangered species, if 1 mile or less:

Land Use

Distance to commercial/industrial area, if 1 mile or less:

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

Distance to residential area, if 2 miles or less:

Distance to agricultural land in production within past 5 years, if 1 mile or less:

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

Is a historic or landmark site (National Register or Historic Places and National Natural Landmarks) within the view of the site?

FIRE AND EXPLOSION

1. CONTAINMENT

Site is not considered a fire and explosion hazard by the local
Hazardous substances present: fire marshal (15).

Type of containment, if applicable:

* * *

2. WASTE CHARACTERISTICS

Direct Evidence

Type of instrument and measurements:

Ignitability

Compound used:

Reactivity

Most reactive compound:

Incompatibility

Most incompatible pair of compounds:

* * *

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility:

Basis of estimating and/or computing waste quantity:

* * *

3 TARGETS

Distance to Nearest Population

Distance to Nearest Building

Distance to Sensitive Environment

Distance to wetlands:

Distance to critical habitat:

Land Use

Distance to commercial/industrial area, if 1 mile or less:

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

Distance to residential area, if 2 miles or less:

Distance to agricultural land in production within past 5 years, if 1 mile or less:

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

Is a historic or landmark site (National Register or Historic Places and National Natural Landmarks) within the view of the site?

Population Within 2-Mile Radius

Buildings Within 2-Mile Radius

DIRECT CONTACT

1. OBSERVED INCIDENT None known to date.

Date, location, and pertinent details of incident:

* * *

2. ACCESSIBILITY

Describe type of barrier(s):

Fence surrounds site with wire gates and signs.

Score = 2

* * *

3. CONTAINMENT

Type of containment, if applicable:

Drums which were observed to be leaking (1). Spilled materials from "empty" and from sources observed and detected in soil analyses. (1,2).

Score = 15

* * *

4. WASTE CHARACTERISTICS

Toxicity

Compounds evaluated:

Same as Section 3.4 and mixed hydrocarbons and caustic sludges. (1,2).

Compound with highest score:

Same as Section 3.4 plus mixed hydrocarbons

Score = 3

* * *

5. TARGETS

Population within one-mile radius

Estimated population within 1 mile is 10,000 persons (11).

Score = 4

Distance to critical habitat (of endangered species)

The same as Section 4.5 - Surface Water Targets.

Score = 2

References

- 1) Final report of the R.V. Hopkins, Inc. site investigation; W. Oberle, Ecology & Environment, Inc. FIT; 2/13/85. TDD #R-07-8402-13A.
- 2) Preliminary report of an uncontrolled hazardous waste site investigation; Frank Coates, U.S. Environmental Protection Agency, EP&R/VII; 7/7/82; IAD022096028.
- 3) Letter report on SW 1/4 of Sec. 34; T.78N., R.3E. and NW 1/4 of Sec. 3, T.77N, R.3E. in Scott County, Iowa. Paul Van Dorpe, Iowa Geological Survey; 2/21/84 to William M. Oberle, FIT/VII.
- 4) Drilling log of A.D.(P.) Heusing Bottling Works, Inc. well. Winslow, L.F. - driller. 4/24/61. NW 1/4 of NE 1/4 of NW 1/4 of SW 1/4 of Sec. 34, T.78N., R.3E. of Scott County, Iowa.
- 5) Drilling log of Blackhawk Brewing Co. well. E. Schutz - driller; 03/45-04/45; NW 1/4 of NE 1/4 of NW 1/4 of Sec. 34, T.78N., R.3E. in Scott County, Iowa.
- 6) Drilling logs of monitoring well installation at the R.V. Hopkins Drum Facility, Davenport, IA.; Job No. 784521; 6/29/84; Richard A. Lyons and Russell K. Lovaas, P.E.; Terracon Consultants, Inc., Davenport, Iowa.
- 7) Uncontrolled hazardous waste site ranking system. 1982. Mitre Corp; McLean, VA.
- 8) U.S.G.S. Topographic Map; 1975; Davenport East, IA - Ill. quadrangle; 7.5 minute scale.
- 9) U.S. Fish and Wildlife Service report. March, 1984. Resources inventory for the upper Mississippi River (Guttenberg, Iowa to Saverton, Missouri).
- 10) U.S.G.S. Topographic Map; 1970; Andalusia, Ill. - IA; 7.5 minute scale.
- 11) U.S. Army Corps of Engineers aerial photographs. 1964 & 1977.
- 12) U.S.G.S. Topographic Map; 1970; Davenport West, IA. quadrangle; 7.5 minute scale.
- 13) Iowa Geological Survey; drilling logs of drinking water wells; Dierks Well-NW 1/4 of NE 1/4 of SW 1/4 of Sec. 5; T.77N.; R.3E. Peterson Well-SE 1/4 of NE 1/4 of NE 1/4 of Sec. 31; T.78N., R.3E. Pontius Well-NE 1/4 of SW 1/4 of NE 1/4 of Sec. 32; T.78N., R.3E. Ihlefeld Well-NE 1/4 of NW 1/4 of NE 1/4 of Sec. 32; T.78N.; R.3E.

References (cont.)

- 14) Water resources of Iowa. 1970. Paul J. Horick, Ed.; University Printing Service; Iowa City, IA., p. 40-41.
- 15) Telephone interview with Wm. Bandurski, IDWAWM; 12/26/84; 1445 hours; conducted by Wm. Oberle, E&E/FIT.
- 16) Telephone interview with Mr. Lonnie Miller, Scott County Soil Conservation Service, U.S.D.A.; 2/15/85; Wm. Oberle, E&E.

STATE	Iowa	Davenport (Scott)
NW NE SW	Kenneth Dierks	
SEC.	5	
77 N RGE SE	COMMENCED	COMPLETED
December 16-20, 1948		
C. Hoyer		
CASING RECORD		
96' of 5 7/16" casing		
LOGGED	BY	
May 13, 1948	RW	
REMARKS		
SWL 50		
El. 605'		
T.D. 131'		
PI 80 at 4 gpm		

	Till, org. brn leach.
	gr. calc.
	bf.
	Sh, ll. gr
	gr wh.
	gr.
	gr. wh.
	X Sd, brn v blk fos + sd; Sd, gr wh. gr. A Sd, brn side, gr wh calc., clv A - v
	X Sd, most c, frsta, some clv, A; Sh, gray Sd, most A, clv.
	X Dol, erm, l-f sac silty; Ls wh calcite X Dol, most gr v f-f arg.
605'	
485'	
605 35 570	605 120 485

STATE IOWA		DAVENPORT (SCOTT)	
NE NW NE		GEORGE IHLEFELD	
SEC. 38			
TWP. 78N	RGE. 3E	COMMENCED JAN. 30 - FEB. 6, 1957	COMPLETED
		L.F. WINSLOW	
		CASING RECORD, 278' of 4" CASING	
		LOGGED Nov. 13, 1957 BY NORTHUP	
		REMARKS	
EL 635'			
TD 295'		SWL 60'	
		MAIN WATER 278'-295'	

EMS-3	
PLEIS. ILL. PER. 50. 100 150 200 250 300	TILL ORANGE, OXIDIZED, LEACHED TILL YELLOW, OXIDIZED, UNLEACHED TILL GR., UNOXIDIZED, UNLEACHED SILT LG. GR., CALC. SH. YELLOW, NON CAL. SH. YELLOW - STREAKS M. GR. SH. M. GR. SH. GR. GR., LUMPY SH. LG. GR., LUMPY SH. M. GR., LUMPY SH. LG. GR., LUMPY SH. M. GR., LUMPY SH. LG. GR., LUMPY SH. M. GR., LUMPY SH. GR. GR. LAM. + LUMPY SH. LG. GR. - SOME SILICIFIED, PYRITIC SH. LG. GR. LAM. SS. LG. GR. + BULKY - CALC. + SILICIFIED SS. LG. GR. + BULKY - CALC. + SILICIFIED SS. GR. + ARGILL. GR. - MUDY; SH. GR. RES. M. GR. SS. GR. SS. LG. GR. + ARGILL. GR. - CALC. + SILICIFIED DOLOMITE + SS. LG. GR. + PIRIT. A - F DOLOMITE - F, SOME MUDY PULV. TO 295'

Ref # 9

**RESOURCES INVENTORY FOR THE
UPPER MISSISSIPPI RIVER
(Guttenberg, Iowa to Saverton, Missouri)**

Prepared for
U.S. Army Corps of Engineers
Rock Island District
Rock Island, Illinois 61201

under
Letter Order No. NCR-LO-83-C9

Compiled by
Gail A. Peterson
U.S. Fish and Wildlife Service
1830 Second Avenue
Rock Island, Illinois 61201

March 1984

RIVER MILE 478-483

Structures and Hazards

RM 482.9 Aerial transmission line.
 RM 481.8-482.8 Strong current below lock and dam 15.
 RM 482.4 Submerged pipeline or cable.
 RM 479.0R-481.0R Wing dam emergent at low water levels.
 RM 480.8L Rock Island River Terminal, Rock Island, IL.
 Service: transfer and storage of all classes of commodities.
 RM 478.4L-479.2L Occasional strong current below the mouth of the Rock River.

Fisheries

RM 482.9L Live Lampsilis higginsii found in muskrat midden (Kindschi 1980).
 RM 482.1L-482.9L Mussel collection, 22 species (Ecological Analysts 1981e).
 RM 482.5R-482.7R Locks and Dam 15 tailwaters, important sport-fishery of white bass, channel catfish, walleye, sauger and freshwater drum (Bertrand 1974). Also, spawning habitat for walleye and sauger.
 RM 482.6L No mussels collected (Perry 1979).
 RM 481.3L-482.5L Mussel bed identified by commercial fishermen. Poor quality.
 RM 481.4L-482.1L Mussel collection, 15 species (Ecological Analysts 1981e).
 RM 480.7L-482.0L Mussel collection, 18 species (Fuller 1978) and 11 species (Frietag 1978), including shells of Lampsilis higginsii and Cumberlandia monodonta.
 RM 478.0-482.0 Documentation of blue sucker, a species significantly reduced in number in this area. (A. Van Vooren pers. comm.).
 RM 481.6L Mussel collection, shells of 20 species (Perry 1979) including Cumberlandia monodonta.
 RM 481.0R-481.5R Commercial sturgeon fishing area.
 RM 478.5R-481.5R Mussel collection, 10 species (USFWS unpublished data).
 RM 479.0R-480.5R Wing dam areas, important walleye sportfishery.
 RM 478.0R-480.7R Credit Island Slough and main channel border, important sportfishery of bluegill and crappie (Bertrand 1974). Probably shallow water wintering area in Credit Island Slough.
 RM 480.0L Lake Potter, important sportfishery of bluegill, largemouth bass. Also, winter fish habitat.
 RM 478.5L-479.1L Mussel bed identified by commercial fishermen.
 RM 478.5R Mussel collection, 10 species (ERT 1980).
 RM 478.0R-478.3R Mussel collections, 19 species including Lampsilis higginsii (Perry 1979).
 RM 478.2R Mussel shell collected of Lampsilis higginsii (Kindschi 1980).
 RM 478.0R Easy access for shoreline fishing.

RIVER MILE 478-483

Wildlife

- RM 478.0-483.0 Essential temporary resting habitat for river otters, Illinois threatened species, (Anderson and Woolf 1984).
- RM 478.5-483.0 Extensive eagle feeding/perching area (Dunstan 1982, Nelson 1980).
- RM 480.4R-480.8R Pelican Island, relatively undisturbed area providing good wildlife habitat.
- RM 478.5R-480.3R Credit Island and Pelican Island used for eagle feeding/perching area.
- RM 478.3R-478.5R Nahant Marsh, important furbearer and fisheries habitat.
- RM 478.1L Interstate 280 great blue heron, great egret (Illinois endangered species), and black-crowned night heron (Illinois endangered species) rookery (Nicklaus 1977).

Recreation

- RM 482.7L Lock and Dam 15 Visitor Center and lock viewing area.
- RM 482.4R LeClaire Park
- RM 482.4R Main Street boat ramp
- RM 481.0R Davenport Boat Club
- RM 480.5R Credit Island public boat ramp
- RM 480.2L Rock Island Boat Club
- RM 480.1L Sunset Park (ramp)
- RM 479.8R Credit Island Park (historic site of Battle of Credit Island).
- RM 479.8L Sunset Park Harbor and Marina
- RM 479.1R Walter Beuse Memorial Ramp
- RM 478.2R Private boat ramp
- RM 478.1R Private boat ramp

Ref #15

TELEPHONE CONVERSATION RECORD

DATE OF CALL: Dec. 26, 1984 TIME OF CALL: 1445 hrs.

PERSONS INVOLVED:

- 1) Wm. Oberle 2) Wm Bandurski - Iowa Dept. of
3) Ecology & Environment 4) Water, Air & Waste Mgt.

PROJECT TITLE: R-V, Hopkins, Inc PROJECT NUMBER: TD0# R7-8402-13A

CLIENT: U.S. EPA; Region VII

SUBJECT OF CALL: Surface Water uses & fire hazards

RESUME OF CONVERSATION:

Mr. Bandurski called and stated that
E&C needs to talk to state of Illinois & Moline
& Rock Island, Illinois environmental personnel
about drinking water intakes as the state of
Iowa has no information concerning them.

He also stated that he had called
Fire Chief Lawrence Hartman (Scott Cty. Disaster Sucs.)
concerning the fire and explosion hazards route.
He stated that Mr. Hartman had told him
that the Hopkins facility had been burned
to the ground in a severe fire approx. 7-10 years
ago (1974-77) and that exploding barrels had been
a fire fighting problem. The Hopkins site had had
only a couple of small roof fires since then.
Site is subject to annual cursory inspections.

CC: _____

June 29, 1984

Ecology and Environment, Incorporated
4350 Johnson Drive
Shawnee Mission, Kansas 66205

Attention: Mr. William Oberle RE: Soil Borings and Monitoring
Well Installation,
R. V. Hopkins Drum Facility,
Davenport, Iowa.
Job No. 784521

Gentlemen:

Enclosed are the boring logs for the soil borings and monitoring wells installed during the period June 5 through June 7, 1984. Five monitoring wells MW1 through MW5 were installed. Two additional auger borings numbered B-2 and B-3 were performed also.

Monitoring wells were drilled using hollow stem augers. These boreholes were instrumented with 2 inch I.D. Schedule 40 PVC pipe, previously approved in lieu of Schedule 80 PVC, having flush threaded joints. Field operations were conducted in accordance with bid specification for "Drilling, Sampling, and Installation of Monitoring Wells", TDD R-7-8402-13A dated May 17, 1984, pages 1-12 inclusive. The completed wells were installed with a vented hanger cap attached by a polypropylene rope to a dedicated bailer for each well. A locking steel protective casing was placed around the PVC pipe and set in a cement grout. Protective casings were locked with keyed-alike padlocks and these keys turned over to E & E, I personnel. As requested by your representatives, monitoring wells were allowed to set and stabilize for a period of 24 hours prior to purging using water obtained from municipal water supply on site.

The soils from the borings were logged at the time of drilling. The drillers' field descriptions, based on observations of disturbed samples, are indicated on the boring logs. Disturbed samples were obtained at regular intervals using both 3-inch O.D. and 2-inch O.D. split-barrel samplers. The sampler was

Job No. 784521

June 29, 1984

Terracon Consultants, Inc.

advanced by means of a 140 pound hammer with a free fall of 30 inches. The number of blows to advance the sampler the last 12 inches of the sampling interval was typically recorded on the boring logs at the test depths. These samples were given to Ecology and Environment, Incorporated personnel at the site.

Groundwater observations and measurements were performed during and immediately after completion of the drilling operations and are indicated on the boring logs.

The auger borings were performed and monitoring wells installed at locations selected in the field by Ecology & Environment, Incorporated personnel. It is our understanding that ground surface elevations at the auger boring and monitoring well locations are to be determined by Ecology and Environment, Incorporated.

If there are any questions, or if we may be of further service, please contact us.

Very truly yours,

TERRACON CONSULTANTS, INC.

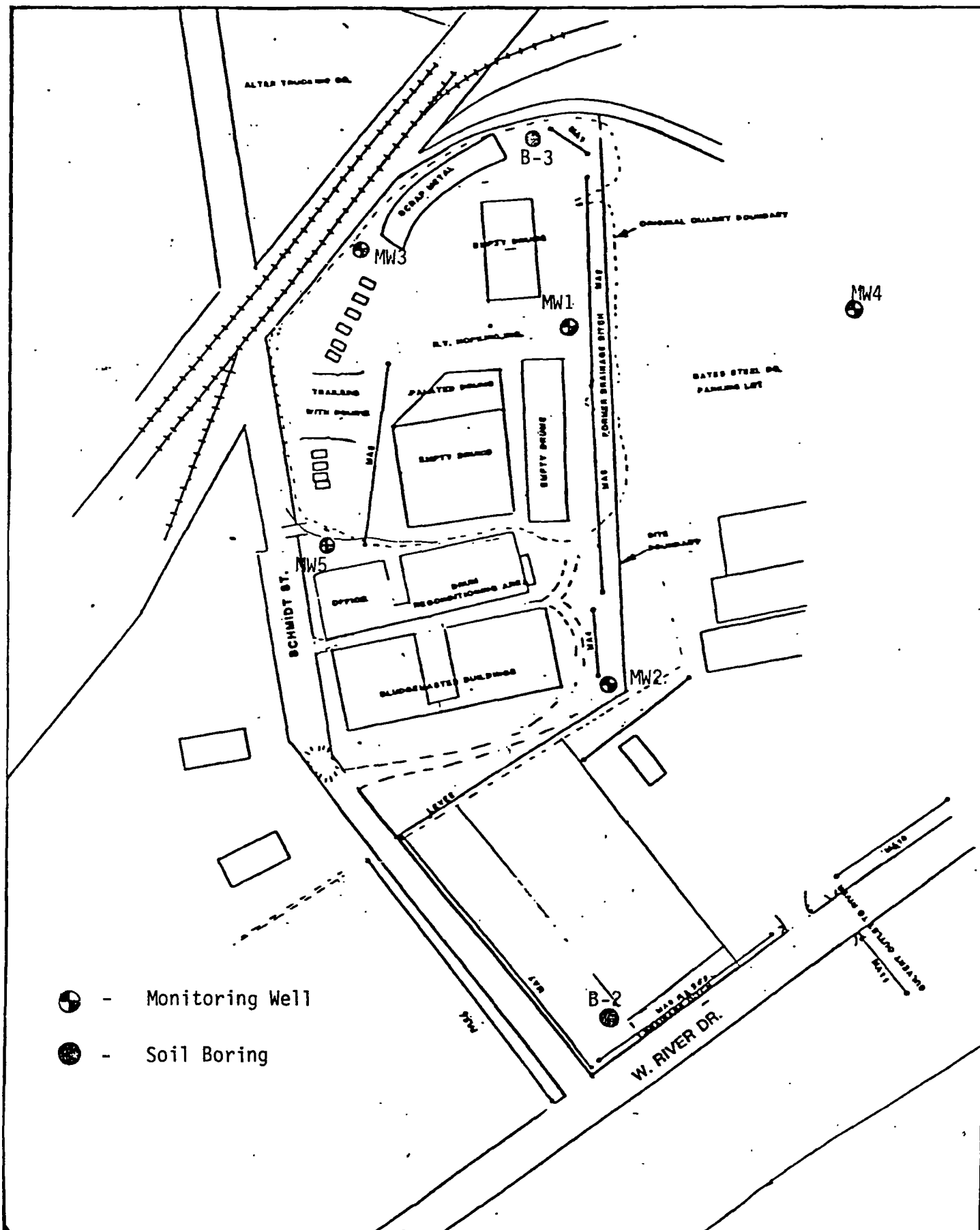


Richard A. Lyons
Project Engineer

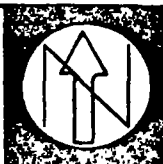


Russell K. Lovaas
Registered Professional Engineer
Iowa #6161

RAL:RKL/wsh



R.V. HOPKINS DRUM FACILITY
TDD No. R7-8402-13A
DAVENPORT, IOWA



Terracon Consultants, Inc.
Cedar Falls Cedar Rapids Davenport Des Moines, IA
Kansas City Wichita, KS
Oklahoma City Tulsa, OK

DEK	NTS	6-25-84	784521
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GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS	: Split Spoon—1½" I.D., 2" O.D., unless otherwise noted	PS	: Piston Sample
ST	: Shelby Tube—2" O.D., unless otherwise noted	WS	: Wash Sample
PA	: Power Auger	FT	: Fish Tail
HA	: Hand Auger	RB	: Rock Bit
DB	: Diamond Bit—4 in, N, B	BS	: Bulk Sample
AS	: Auger Sample	PM	: Pressuremeter
HS	: Hollow Stem Auger	DC	: Dutch Cone
VS	: Vane Shear		

Standard "N" Penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch OD split spoon, except where noted.

WATER LEVEL MEASUREMENT SYMBOLS:

WL	: Water Level	WS	: While Sampling
WCI	: Wet Cave In	WD	: While Drilling
DCI	: Dry Cave In	BCR	: Before Casing Removal
AB	: After Boring	ACR	: After Casing Removal

Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In pervious soils, the indicated elevations are considered reliable ground water levels. In low permeability soils, the accurate determination of ground water elevations is not possible in even several days observation, and additional evidence of ground water elevations must be sought.

DESCRIPTIVE SOIL CLASSIFICATION:

Coarse Grained or Granular Soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50 % of their dry weight retained on a #200 sieve; they are described as: clays, or clayey silts if they are cohesive, and silts if they are slightly cohesive or non-cohesive. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, granular soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their consistency and plasticity. Example: Clayey silt, trace sand moderately plastic, stiff; silty fine sand, trace gravel, medium dense.

GRAIN SIZE TERMINOLOGY

Major Component Of Sample	Size Range
Boulders	Over 8 in. (200mm)
Cobbles	8 in. to 3 in. (200mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 2mm)
Sand	#4 to #200 sieve (2mm to .074mm)
Silt or Clay	Passing #200 sieve (0.074mm)

RELATIVE DENSITY OF GRANULAR SOILS:

N-Blows/ft.	Relative Density
0-3	Very Loose
4-9	Loose
10-29	Medium Dense
30-49	Dense
50-80	Very Dense
80 +	Extremely Dense

CONSISTENCY OF COHESIVE SOILS:

Unconfined Compressive Strength, Qu, psf	Consistency
≤ 500	Very Soft
500- 1,000	Soft
1,000- 2,000	Medium
2,000- 4,000	Stiff
4,000- 8,000	Very Stiff
8,000-16,000	Hard
► 16,000	Very Hard

RELATIVE PROPORTIONS

Descriptive Term(s) (Of Components Also Present in Sample)	Percent of Dry Weight
Trace	1-10
Little	10-20
Some	20-35
And	35-50

PLASTICITY OF FINE GRAINED SOILS:

Term	Plasticity Index
None to slight	0- 3
Slight	4- 7
Moderate	8-25
High	► 25

LOG OF BORING NO. B-2												
OWNER R. V. HOPKINS						ARCHITECT-ENGINEER ECOLOGY & ENVIRONMENT, INC.						
SITE DAVENPORT, IOWA						PROJECT NAME MONITORING WELL INSTALLATION						
Sample No.	Type Sample	Sampling Distance	Recovery	Blows/ft.	Unconfined Compressive Strength-lbs./ft. ²	Water Content-%	Dry Density-lbs./ft. ³	Unified Class. Symbol	Depth	Elevation	Description	
	PA										2" Crushed rock	
											(2.0) CLAYEY SILT, Brown	
											SILTY CLAY, Red Brown	
											(6.0) Weathered Limestone @ 6.0'	
											Bottom of Boring	
											NOTE: Soil and rock descriptions are from drillers' logs based on field observations of disturbed samples.	
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU. THE TRANSITION MAY BE GRADUAL												
WATER LEVEL OBSERVATIONS				Terracon Consultants, Inc. Cedar Falls Cedar Rapids Davenport Des Moines Storm Lake, IA Kansas City Wichita, KS Omaha, NE Oklahoma City Tulsa, OK				BORING STARTED 6/7/84				
W.L.	None	W.S. OR W.D.	None					A.B.	BORING COMPLETED 6/7/84			
W.L.	B.C.R.		A.C.R.					RIG 2		FOREMAN SFM		
W.L.									APPROVED RAL		JOB # 784521	

LOG OF BORING NO. B-3											
OWNER R. V. HOPKINS								ARCHITECT-ENGINEER ECOLOGY & ENVIRONMENT, INC.			
SITE DAVENPORT, IOWA								PROJECT NAME MONITORING WELL INSTALLATION			
Sample No.	Type Sample	Sampling Distance	Recovery	Blows/ft.	Unconfined Compressive Strength-lbs./ft. ²	Water Content-%	Dry Density-lbs./ft. ³	Unified Class. Symbol	Depth	Elevation	Description
	PA								<div style="display: flex; align-items: center;"> <div style="width: 20px; text-align: center;">5</div> <div style="width: 100px; border-left: 1px solid black; position: relative;"> <div style="position: absolute; top: -5px; left: 0; right: 0; border-bottom: 1px solid black;"></div> <div style="position: absolute; bottom: -5px; left: 0; right: 0; border-bottom: 1px solid black;"></div> </div> </div>		(1.5) <u>FILL, CLAYEY SILT, Brown</u> <u>FILL, SANDY GRAVELLY SILT WITH CONCRETE RUBBLE, Dark Gray</u> (13.0) (14.8) <u>SILTY CLAY, Dark Brown</u> (15.0) <u>WEATHERED LIMESTONE</u> Bottom of Boring Power Auger Refusal @ 15.0' No Monitoring Well Installed. NOTE: Soil and rock descriptions are from drillers' logs based on field observations of disturbed samples.
									<div style="display: flex; align-items: center;"> <div style="width: 20px; text-align: center;">15</div> <div style="width: 100px; border-left: 1px solid black; position: relative;"> <div style="position: absolute; top: -5px; left: 0; right: 0; border-bottom: 1px solid black;"></div> <div style="position: absolute; bottom: -5px; left: 0; right: 0; border-bottom: 1px solid black;"></div> </div> </div>		

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES IN-SITU. THE TRANSITION MAY BE GRADUAL

WATER LEVEL OBSERVATIONS				Terracon Consultants, Inc. Cedar Falls Cedar Rapids Davenport Des Moines Storm Lake, IA Kansas City Wichita, KS Omaha, NE Oklahoma City Tulsa, OK	BORING STARTED 6/5/84	
W.L.	8' ±	W.S. OR W.D.	A.B.		BORING COMPLETED 6/5/84	
W.L.		B.C.R.	A.C.R.		RIG 2A	FOREMAN JAF
W.L.					APPROVED RAL	JOB # 784521

LOG OF BORING NO. MW1												
OWNER								ARCHITECT-ENGINEER				
R. V. HOPKINS								ECOLOGY & ENVIRONMENT, INC.				
SITE								PROJECT NAME				
DAVENPORT, IOWA								MONITORING WELL INSTALLATION				
Sample No.	Type Sample	Sampling Distance	Recovery	Blows/ft.	Unconfined Compressive Strength-lbs./ft. ²	Water Content-%	Dry Density-lbs./ft. ³	Unified Class. Symbol	Depth	Elevation	Description	
	HS										FILL, SAND, GRAVEL, LIMESTONE COBBLES AND BOULDERS, AND CONCRETE, BRICK, STEEL AND WIRE RUBBLE	
1	SS	18		3/6" 13/6" 20/6"					5			
	HS											
2	SS	24		8					10		(12.0)	
	HS										SAND AND GRAVELLY SILT, Gray	
3	SS	24		2					15			
	HS										(19.8)	
4	SS	2		30/2"					20		(21.7)	
	HS										WEATHERED LIMESTONE, Brown Gray	
	3" O.D.	split-barrel sampler used.										Bottom of Boring Hollow Stem Auger Refusal @ 21.7' NOTE: Soil and rock descriptions are from drillers' logs based on field observations of disturbed samples.

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES IN-SITU. THE TRANSITION MAY BE GRADUAL.												
WATER LEVEL OBSERVATIONS					Terracon Consultants, Inc. Cedar Falls Cedar Rapids Davenport Des Moines Storm Lake, IA Kansas City Wichita, KS Omaha, NE Oklahoma City Tulsa, OK			BORING STARTED 6/5/84				
W.L.		6' ± W.S. OR W.D.		A.B.				BORING COMPLETED 6/6/84				
W.L.		B.C.R.		A.C.R.				RIG 2A		FOREMAN JAF		
W.L.								APPROVED RAL		JOB # 784521		

**MONITORING WELL
DOCUMENTATION FOR
NO. MW-1**

R.V. HOPKINS DRUM FACILITY
DAVENPORT, IOWA

ID. 784521

Strata to be Monitored is fill material above bedrock.

plant which

Below Ground Surface That Monitored Strata

OF WELL:
Monitor water quality for background purposes
Monitor leachate quality within sanitary landfills
Monitor groundwater quality in the direction of flow
Other: Describe

flow

OF WELL:
Location of the monitoring point accurate
Where? Locations of wells are as field-drawn

Location diagram?
Personnel.

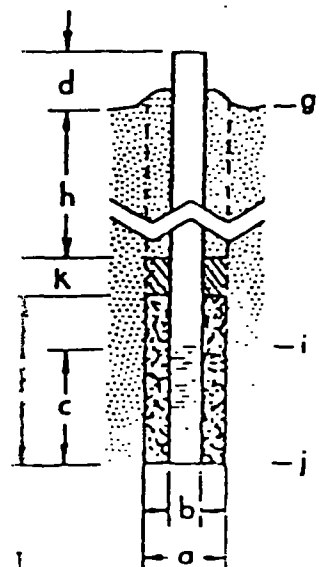
CONSTRUCTION DETAILS:
Diameter (a) 6.0 Inches
Diameter (b) 2.0 Inches I.D.
Material Flushed threaded PVC
Length (c) 10.0' Screen Open
Depth (i) 6.7' to (j) 16.7'
Surface Elevation at Well (g) Unknown
Height of Well Head Above Ground (d) 2.1'
Distance from Head (e) 23.8' **

Type	Depth
Well Pack	(f) 4.5' - 21.7'
Sealed Bentonite	(k) 2.5' - 4.5'
	(h) 0.0' - 2.5'

Well Cap Vented PVC cap/bailer combination

Applicable

**** Necessary to rockbit as per Federal Inspection remove, replace, and**



LOG OF BORING NO. MW2												
OWNER R. V. HOPKINS						ARCHITECT-ENGINEER ECOLOGY & ENVIRONMENT, INC.						
SITE DAVENPORT, IOWA						PROJECT NAME MONITORING WELL INSTALLATION						
Sample No.	Type Sample	Sampling Distance	Recovery	Blows/ft.	Unconfined Compressive Strength-lbs./ft. ²	Water Content-%	Dry Density-lbs./ft. ³	Unified Class. Symbol	Depth	Elevation	Description	
	HS										<div style="text-align: center;"> </div>	CLAYEY SILT, Dark Brown
1	SS	24		15								(7.0)
	HS											CLAYEY SILT, Gray
2	SS	24		7								(14.7)
	HS											INTERBEDDED WEATHERED LIMESTONE AND SHALE
3	SS	22		50/final	4"						(16.8)	
	3" O.D.	split-barrel sampler used.									Bottom of Boring	
NOTE: Soil and rock descriptions are from drillers' logs based on field observations of disturbed samples.												
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES IN-SITU. THE TRANSITION MAY BE GRADUAL												
WATER LEVEL OBSERVATIONS						Terracon Consultants, Inc. Cedar Falls Cedar Rapids Davenport Des Moines Storm Lake, IA Kansas City Wichita, KS Omaha, NE Oklahoma City Tulsa, OK			BORING STARTED 6/7/84			
W.L.	5' ±	W.S. OR W.D.	A.B.						BORING COMPLETED 6/7/84			
W.L.	B.C.R.		A.C.R.						RIG 2A		FOREMAN JAF	
W.L.									APPROVED RAL		JOB # 784521	

MONITORING WELL
DOCUMENTATION FORM
NO. MW-2

PROJECT: R.V. HOPKINS DRUM FACILITY
DAVENPORT, IOWA

PROJECT NO. 784521

Specific Strata to be Monitored is fill material below the existing plant which lies above bedrock.

Depth Below Ground Surface That Monitored Strata Was Encountered *

PURPOSE OF WELL:

- ☒ Monitor water quality for background purposes
☐ Monitor leachate quality within sanitary landfill
☐ Monitor groundwater quality in the direction of groundwater flow
☐ Other: Describe _____

LOCATION OF WELL:

Is the location of the monitoring point accurately shown on the location diagram?
Yes. Where? Locations of wells are as field-determined by E&E personnel.

CONSTRUCTION DETAILS:

Boring Diameter (a) 6.0 Inches

Casing Diameter (b) 2.0 inches I.D.

Casing Material Flushthreaded PVC

Screening length (c) 10.0 ' Screen Opening .01 Inches

From Depth (i) 6.8 ' to (j) 16.8 '

Ground Surface Elevation at Well (g) Unknown

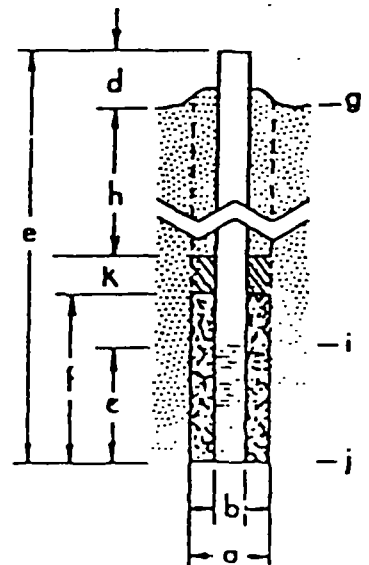
Height of Well Head Above Ground (d) 2.5 '

Depth of Well From Head (e) 19.3 '

Backfill:

Type	Depth
<u>Granular Well Pack</u>	(f) <u>5.0' - 16.8'</u>
<u>Pelletized Bentonite</u>	(k) <u>1.5' - 5.0'</u>
<u>Grout</u>	(h) <u>0.0' - 1.5'</u>

Type of Well Cap Vented PVC cap/bailer combination.



*Not Applicable

LOG OF BORING NO. MW3											
OWNER R. V. HOPKINS						ARCHITECT-ENGINEER ECOLOGY & ENVIRONMENT, INC.					
SITE DAVENPORT, IOWA						PROJECT NAME MONITORING WELL INSTALLATION					
Sample No.	Type Sample	Sampling Distance	Recovery	Blows/ft.	Unconfined Compressive Strength-lbs./ft. ²	Water Content-%	Dry Density-lbs./ft. ³	Unified Class. Symbol	Depth	Elevation	Description
	HS										<p><u>FILL, SANDY SILTY CLAY, CLAYEY SILT AND SILTY SAND,</u> Dark Brown to Brown with concrete, brick and apparent fly ash rubble.</p> <p>(Rod drop 10.0' to 13.5' for one blow)</p> <p>(Rod drop 15.5' to 18.0' for one blow)</p>
1	SS	18		5					5		
	HS										
2	SS	42		1/3.5'					10		
	HS										
3	SS	36		1/6" 1/2.5'					15		
	HS										(17.0)
4	SS	13		50 1/2"					20		<p>(21.0) (POSSIBLE FILL), SANDY SILT, LITTLE CLAY, Dark Gray (Pushed rod 20.0' to 21.25' in sampling interval)</p> <p>(21.3) <u>WEATHERED LIMESTONE, Gray</u></p>
											<p>Bottom of Boring</p> <p>NOTE: Soil and rock descriptions are from drillers' logs based on field observations of disturbed samples.</p> <p>Borehole relocated 2.5 feet north due to rubble obstruction at 9.0' depth.</p>

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES. IN-SITU, THE TRANSITION MAY BE GRADUAL

WATER LEVEL OBSERVATIONS				Terracon Consultants, Inc. Cedar Falls Cedar Rapids Davenport Des Moines Storm Lake, IA Kansas City Wichita, KS Omaha, NE Oklahoma City Tulsa, OK	BORING STARTED 6/7/84	
W.L.	3.5'	W.S. OR W.D.	A.B.		BORING COMPLETED 6/7/84	
W.L.		B.C.R.	A.C.R.		RIG 2	FOREMAN SFM
W.L.					APPROVED RAL	JOB # 784521

MONITORING WELL
DOCUMENTATION FORM
NO. MW-3

PROJECT: R.V. HOPKINS DRUM FACILITY
DAVENPORT, IOWA

PROJECT NO. 784521

Specific Strata to be Monitored is fill material below the existing plant which
lies above bedrock.

Depth Below Ground Surface That Monitored Strata Was Encountered . *

PURPOSE OF WELL:

☒ Monitor water quality for background purposes
☐ Monitor leachate quality within sanitary landfill
☐ Monitor groundwater quality in the direction of groundwater flow
☐ Other: Describe _____

LOCATION OF WELL:

Is the location of the monitoring point accurately shown on the location diagram?
Yes . Where? Locations of wells are as field-determined by E&I personnel.

CONSTRUCTION DETAILS:

Boring Diameter (a) 6.0 inches

Casing Diameter (b) 2.0 inches I.D.

Casing Material Flushthreaded PVC

Screening length (c) 10.0 ' Screen Opening .01 inches

From Depth (i) 6.3 ' to (j) 16.3 '

Ground Surface Elevation at Well (g) Unknown

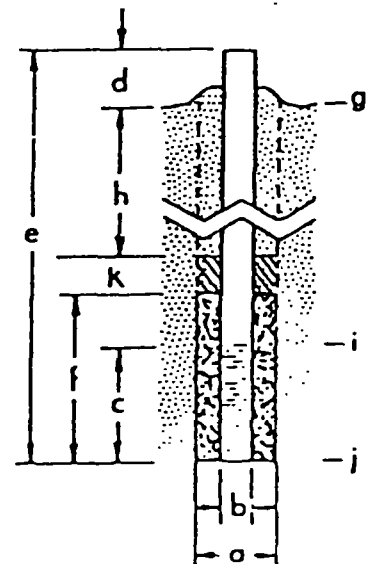
Height of Well Head Above Ground (d) 2.5 '

Depth of Well From Head (e) 23.8 '

Backfill:

Type	Depth
<u>Granular Well Pack</u>	(f) <u>2.8' - 21.3' **</u>
<u>Pelletized Bentonite</u>	(k) <u>2.0' - 3.8'</u>
<u>Grout</u>	(h) <u>0.0' - 2.0'</u>

Type of Well Cap Vented PVC cap/bailer combination.



*Not Applicable

** Backfilling with wellpack required 1400 lbs. material due to voids in fill material.

LOG OF BORING NO. MW4											
OWNER R. V. HOPKINS								ARCHITECT-ENGINEER ECOLOGY & ENVIRONMENT, INC.			
SITE DAVENPORT, IOWA								PROJECT NAME MONITORING WELL INSTALLATION			
Sample No.	Type Sample	Sampling Distance	Recovery	Blows/ft.	Unconfined Compressive Strength-lbs./ft. ²	Water Content-%	Dry Density-lbs./ft. ³	Unified Class. Symbol	Depth	Elevation	Description
											(0.5) <u>SILT, Brown</u>
	HS										<u>CLAYEY SILT WITH GRAVEL, Brown</u>
1	SS	24		23					5		(5.5)
	HS										<u>SILTY CLAY, TRACE SAND, Gray</u>
2	SS	24		49					10		(13.5)
	HS										(15.0) <u>WEATHERED SHALEY LIMESTONE, Gray</u>
	3" O.D.	Split-Barrel Sampler Used									Bottom of Boring Hollow Stem Auger Refusal @ 15.0'
NOTE: Soil and rock descriptions are from drillers' logs based on field observations of disturbed samples.											
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES. IN-SITU. THE TRANSITION MAY BE GRADUAL											
WATER LEVEL OBSERVATIONS				Terracon Consultants, Inc. Cedar Falls Cedar Rapids Davenport Des Moines Storm Lake, IA Kansas City Wichita, KS Omaha, NE Oklahoma City Tulsa, OK				BORING STARTED 6/6/84			
W.L.	None	W.S. OR W.D.	A.B.					BORING COMPLETED 6/6/84			
W.L.		B.C.R.	A.C.R.					RIG 2A FOREMAN JAF			
W.L.								APPROVED RAL JOB # 784521			

MONITORING WELL
DOCUMENTATION FORM
NO. MW-4

PROJECT: R.V. HOPKINS DRUM FACILITY
DAVENPORT, IOWA

PROJECT NO. 784521

Specific Strata to be Monitored is fill material below the existing plant which
lies above bedrock.

Depth Below Ground Surface That Monitored Strata Was Encountered *

PURPOSE OF WELL:

☒ Monitor water quality for background purposes
☐ Monitor leachate quality within sanitary landfill
☐ Monitor groundwater quality in the direction of groundwater flow
☐ Other: Describe _____

LOCATION OF WELL:

Is the location of the monitoring point accurately shown on the location diagram?
Yes. Where? Locations of wells are as field-determined by E&I personnel.

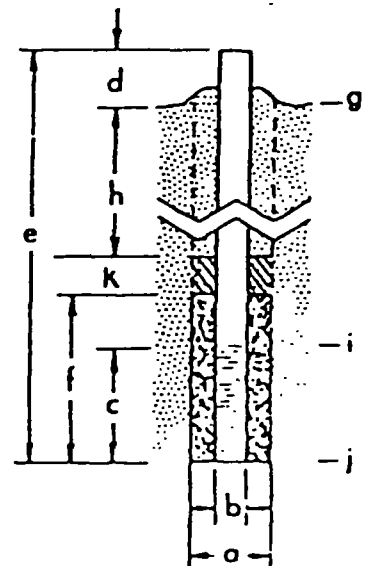
CONSTRUCTION DETAILS:

Boring Diameter (a) 6.0 inches
Casing Diameter (b) 2.0 inches I.D.
Casing Material Flushthreaded PVC
Screening length (c) 10.0 ' Screen Opening .01 inches
From Depth (i) 5.0 ' to (j) 15.0 '
Ground Surface Elevation at Well (g) unknown
Height of Well Head Above Ground (d) 2.3 '
Depth of Well From Head (e) 17.3 '

Backfill:

Type	Depth
<u>Granular Well Pack</u>	(f) <u>5.0' - 15.0'</u>
<u>Pelletized Bentonite</u>	(k) <u>2.0' - 5.0'</u>
<u>Grout</u>	(h) <u>0.0' - 2.0'</u>

Type of Well Cap Vented PVC cap/bailer combination.



*Not Applicable

LOG OF BORING NO. MW5																										
OWNER R. V. HOPKINS								ARCHITECT-ENGINEER ECOLOGY & ENVIRONMENT, INC.																		
SITE DAVENPORT, IOWA								PROJECT NAME MONITORING WELL INSTALLATION																		
Sample No.	Type Sample	Sampling Distance	Recovery	Blows/ft.	Unconfined Compressive Strength-lbs./ft. ²	Water Content-%	Dry Density-lbs./ft. ³	Unified Class. Symbol	Depth	Elevation	Description															
	HS										2" Crushed Stone FILL, SILTY CLAY, Brown WITH BRICK, CONCRETE AND OTHER MISCELLANEOUS FILL,															
1	SS	24		7					5		(6.0)															
	HS										(7.0) <u>SILTY CLAY</u> , Dark Brown															
2	SS	24		12					10		<u>SILTY CLAY</u> , Gray															
	HS								15		(15.9)															
3	SS	23		60/final 3'							(16.9) <u>INTERBEDDED WEATHERED LIMESTONE AND SHALE</u> ,															
	3" O.D.	Split-Barrel Sampler used									Bottom of Boring															
NOTE: Soil and rock descriptions are from drillers' logs based on field observations of disturbed samples.																										
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES. IN-SITU, THE TRANSITION MAY BE GRADUAL																										
WATER LEVEL OBSERVATIONS <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>W.L.</td> <td>6.0'</td> <td>W.S. OR W.D.</td> <td>5.6'</td> <td>A.B.</td> </tr> <tr> <td>W.L.</td> <td></td> <td>B.C.R.</td> <td></td> <td>A.C.R.</td> </tr> <tr> <td>W.L.</td> <td></td> <td></td> <td></td> <td></td> </tr> </table>								W.L.	6.0'	W.S. OR W.D.	5.6'	A.B.	W.L.		B.C.R.		A.C.R.	W.L.					Terracon Consultants, Inc. Cedar Falls Cedar Rapids Davenport Des Moines Storm Lake, IA Kansas City Wichita, KS Omaha, NE Oklahoma City Tulsa, OK		BORING STARTED 6/7/84 BORING COMPLETED 6/7/84 RIG 2A FOREMAN JAF APPROVED RAL JOB # 784521	
W.L.	6.0'	W.S. OR W.D.	5.6'	A.B.																						
W.L.		B.C.R.		A.C.R.																						
W.L.																										

MONITORING WELL
DOCUMENTATION FORM
NO. MW-5

PROJECT: R.V. HOPKINS DRUM FACILITY
DAVENPORT, IOWA

PROJECT NO. 784521

Specific Strata to be Monitored is fill material below the existing plant which
lies above bedrock.

Depth Below Ground Surface That Monitored Strata Was Encountered *

PURPOSE OF WELL:

☒ Monitor water quality for background purposes
☐ Monitor leachate quality within sanitary landfill
☐ Monitor groundwater quality in the direction of groundwater flow
☐ Other: Describe _____

LOCATION OF WELL:

Is the location of the monitoring point accurately shown on the location diagram?
Yes . Where? Locations of wells are as field-determined by E&I personnel.

CONSTRUCTION DETAILS:

Boring Diameter (a) 6.0 inches

Casing Diameter (b) 2.0 inches I.D.

Casing Material Flushtthreaded PVC

Screening length (c) 10.0 ' Screen Opening .01 inches

From Depth (i) 6.0 ' to (j) 16.0 '

Ground Surface Elevation at Well (g) Unknown

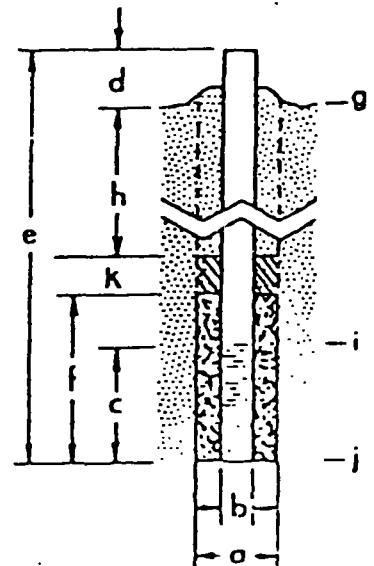
Height of Well Head Above Ground (d) 2.5 '

Depth of Well From Head (e) 18.5 '

Backfill:

Type	Depth
<u>Granular Well Pack</u>	(f) <u>4.5' - 16.9'</u>
<u>Pelletized Bentonite</u>	(k) <u>2.5' - 4.5'</u>
<u>Grout</u>	(h) <u>0.0' - 2.5'</u>

Type of Well Cap Vented PVC cap/bailer combination.



*Not Applicable

UNIFIED SOIL CLASSIFICATION SYSTEM

Major divisions			Group symbols	Typical names	Laboratory classification criteria									
<div>Coarse-grained soils (More than half of material is larger than No. 200 sieve size)</div> <div>Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 per cent GW, GP, SW, SP More than 5 per cent GM, GC, SM, SC More than 12 per cent Borderline cases requiring dual symbols 5 to 12 per cent</div>					Gravels (More than half of coarse fraction larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3					
							GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW					
						Gravels with fines (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are <i>borderline cases</i> requiring use of dual symbols				
							GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7					
					Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3					
							SP	Poorly graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW					
						Sands with fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in hatched zone with P.I. between 4 and 7 are <i>borderline cases</i> requiring use of dual symbols.				
							SC	Clayey sands, sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7					
					<div>Fine-grained soils (More than half of material is smaller than No. 200 sieve)</div>					Silt and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	<div>For classification of fine-grained soils and fine fraction of coarse-grained soils. Atterberg Limits plotting in hatched area are <i>borderline classifications</i> requiring use of dual symbols. Equation of A-line: PI = 0.73 (LL - 20)</div>
												CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
OL	Organic silts and organic silty clays of low plasticity													
Silt and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts											
		CH	Inorganic clays of high plasticity, fat clays											
		OH	Organic clays of medium to high plasticity, organic silts											
		Pt	Peat and other highly organic soils											

TERRACON CONSULTANTS, INC.

State of Iowa

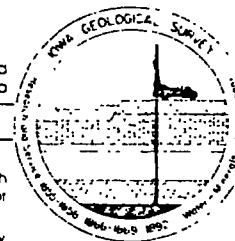
Iowa Geological Survey

123 North Capitol Street • Iowa City, Iowa 52242 • (319) 338-1173

Terry E. Branstad
Governor of Iowa

Donald L. Koch
State Geologist and Director

Orville J. Van Esv
Associate State Geologist



21 February 1984

Mr. Bill Oberle
Ecology and Environment
Eighth and State
Kansas City, Kansas 66101

Dear Mr. Oberle:

At your request, I have researched our strip log data files for geologic and hydrologic information for two areas in Scott County. I will describe each separately.

Center N 1/2, SW, SE, Sec 27, T78N, R4E, Scott County

From the Silvis Quadrangle, this site is on or near the railroad, at an approximate elevation of 571 feet \pm 3 feet. I have enclosed copies of six strip logs in this immediate area. From these and other data files, I would estimate that the bedrock is at or very near the surface, probably less than ten feet deep. The sub-soil materials are probably either loess or alluvium. The uppermost bedrock unit is the Devonian Wapsipinicon Formation. It is approximately 50 feet to 60 feet thick and underlain by the Silurian. Together, the Silurian/Devonian is the major bedrock aquifer of the region.

Any potential surficial contamination which enters the groundwater can be expected to follow the groundwater flow paths of the carbonate aquifer. The Mississippi River is the regional discharge point for groundwater in the Silurian/Devonian aquifer.

Ref # 3 * SW, Sec 34, T78N, R3E; NW, Sec 3, T77N, R3E, Scott County

From the Davenport East Quadrangle, this area is an industrial area along the railroad and the Mississippi River at an approximate elevation of 560 feet \pm 10 feet. I have enclosed copies of the upper portions of eight strip logs in this immediate area.

In general, this area occurs above a buried bedrock channel. Bedrock is expected to be at an elevation of 490 feet \pm 10 feet. However, there is evidence of a bedrock high within the channel area. This can be seen in the Bottling Works, Inc. well where only ten feet of soil is reported above the bedrock. The bedrock high is poorly defined in extent. Therefore, the depth to bedrock may be anywhere from five to ten feet to 80 to 90 feet in this area.

Mr. Bill Oberle
page two

The subsoil materials are generally expected to be sands and gravels associated with either the buried channel aquifer, or the Mississippi River alluvial aquifer. In the area of the bedrock high the uppermost bedrock is the Devonian-Wapsipinicon Formation. It is 95 feet thick in the Bottling Works Inc. well. Elsewhere in the buried channel, the uppermost bedrock is most likely the Wapsipinicon Formation or possibly the Silurian.

In general, the Silurian-Devonian aquifer and the alluvial aquifer are in hydrologic connection. Any potential surficial contamination which enters the groundwater would be expected to follow the water table in this area. Although we do not have any detailed measurements of the water table in this area, I would expect it to be less than 15 feet below land surface. Flow paths are towards the Mississippi River.

I have enclosed a bill for copying costs.

I trust that this information is satisfactory. If you have any questions, please feel free to call again.

Sincerely,

Paul Van Dorpe

Paul Van Dorpe
Research Geologist
Water Resources Division

PVD/dlh

encs.

TELEPHONE CONVERSATION RECORD

DATE OF CALL: Feb 15, 1985 TIME OF CALL: 1500 hrs

PERSONS INVOLVED:

1) Wm. O'Leary - EOC/FIT 2) Louise Miller - U.S.D.A./SCS
319/391-1403
3) _____ 4) _____PROJECT TITLE: R.V. Hopkins Inc PROJECT NUMBER: IDD #A07-8402-13BCLIENT: U.S. EPASUBJECT OF CALL: Rural water usage - Scott Cty, Iowa

RESUME OF CONVERSATION:

Mr. Miller stated that in the area west of Davenport, individual wells were the source of drinking water. He also stated that there were no rural water districts or associations in the county.

CC: file

SEPARATOR PAGE



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 7
25 FUNSTON ROAD
KANSAS CITY, KANSAS 66115

April 25, 1984

MEMORANDUM

SUBJECT: Transmittal of Revisions to HRS Forms For: Radium Petroleum,
Kansas City, Missouri; R. V. Hopkins, Davenport, Iowa;
Maytag Dump, Newton, Iowa

FROM: Paul E. Doherty *PH*
Environmental Engineer, EP&R/ENSV

TO: Robert L. Morby
Chief, WMBR/ARWM

THRU: William J. Keffer *WJK*
Chief, EP&R/ENSV

[Signature]
John C. Wicklund
Director, ENSV

David A. Wagoner
Director, ARWM

Attached for your information and use are revised pages for HRS assessments for the above referenced projects. The original HRS assessments were transmitted to your office on April 13, 1984.

Attachment _____

*HRS was
in
site file*

EPA-ARWM/WMBR

APR 27 1984

Region VII K.C., MO



ecology and environment, inc.

FAIRWAY WEST OFFICE BLDG., 4350 JOHNSON DRIVE, SHAWNEE MISSION, KANSAS 66205, TEL. 913-432-9961

International Specialists in the Environmental Sciences

MEMORANDUM

TO: Paul Doherty
FROM: Jim Buchanan *Jim*
DATE: April 23, 1984
SUBJECT: Final review HRS deliverables R-7-8303-02C

We have completed an internal peer review and finalized the HRS for the sites listed on the attached Acknowledgement of Completion. The following changes should be incorporated in the draft HRS' submitted on April 13:

- Radium Petroleum - Surface Water Route
average slope 3-5%
Figure 7 (attached)
Revised cover sheet (attached)
- R.V. Hopkins - Air route = 0 (Figure 9 attached)
Revised cover sheet attached
- Maytag Dump - change in Surface Water Use under
Surface Water Route
(Figure 7 attached)
Revised cover sheet attached

Site	HRS Score		
	<u>SM</u>	<u>SDC</u>	<u>SFE</u>
Radium Petroleum	3.97		
Michael Company	14.83	50	
Pigeon Hill Landfill	17.47	8.3	
Grease Lake Pond	17.68	50	
Maytag Dump	10.94		
R.V. Hopkins	13.1		
Maurice L. Pond	6.74	27.78	

Should you have any questions please contact us.

JB:sd
Attachments

Facility name: R. V. Hopkins, Inc.

Location: Davenport, Iowa

EPA Region: VII

Person(s) in charge of the facility: Richard V. Hopkins, president
and owner

Name of Reviewer: William Oberle Date: 4/10/84

General description of the facility:
 (For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

The company has reconditioned and stored
drums on this property since 1968. Beginning
in 1892, this site has been a limestone
quarry and in 1940 was used as a
depository for building rubble and salvage.
Chemicals detected ^{on site} by analysis include heavy
metals, organic solvents and pesticides.

Scores: $S_M = 13.1$; ($S_{GW} = 21.9$ $S_{SW} = 6.4$ $S_a = 0.$)
 ~~$S_{FE} = 62.5$~~
 $S_{DC} = 27.78$

FIGURE 1
HRS COVER SHEET

Air Route Work Sheet					
Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1 Observed Release	<u>0</u> 45	1	<u>0</u>	45	5.1
Date and Location: <u>1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.</u>					
Sampling Protocol: <u>1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.</u>					
If line 1 is 0, the $S_a = 0$. Enter on line 5 . If line 1 is 45, then proceed to line 2 .					
2 Waste Characteristics					5.2
Reactivity and Incompatibility	0 1 <u>2</u> 3	1	<u>2</u>	3	
Toxicity	0 1 <u>2</u> 3	3	<u>6</u>	9	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 <u>8</u>	1	<u>8</u>	8	
Total Waste Characteristics Score			<u>16</u>	20	
3 Targets					5.3
Population Within 4-Mile Radius	0 9 12 15 18 21 <u>24</u> 27 30	1	<u>24</u>	30	
Distance to Sensitive Environment	<u>0</u> 1 2 3	2	<u>0</u>	6	
Land Use	0 1 <u>2</u> 3	1	<u>2</u>	3	
Total Targets Score			<u>26</u>	39	
4 Multiply 1 x 2 x 3			<u>0</u>	35,100	
5 Divide line 4 by 35,100 and multiply by 100			$S_a = \underline{0}$		

18720

53.33

FIGURE 9
AIR ROUTE WORK SHEET